WATER FROM GRAVEL WELLS

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The water supply of the Delaware Water Company, Delaware, Ohio, is obtained from rock and gravel wells, three miles north of the city, in a bend of the Olentangy River, covering an area of about 25 acres.

In 1909 an additional supply under the direction of H. F. Dunham, C.E., was obtained by running a suction line about 75 to 100 feet from the river, following its contour for a distance of about 1400 feet. On this line was constructed three deep rock wells, and thirteen gravel wells, the latter being 4-inch with 3 to 4-foot strainers, at an average depth of 28 feet.

During the dry summer of 1914 an additional supply was thought necessary and plans made for additional wells. A new suction line was laid at right angles to the old one, and connected to it with a 10-inch cast iron pipe, and 6 new wells were drilled in the open field some 400 feet from the old line of wells. In this location we found 2 or 3 feet of soil, 12 feet of sand, mixed with some gravel and small boulders, and 12 feet of coarse water bearing gravel. It was evident that at some time, this bend in the river had been its bed.

With a well drilling outfit the new 6-inch galvanized casings were sunk to the rock at an average depth of 28 feet, then the casing withdrawn about 3 feet and a small charge of dynamite exploded at the bottom, after which the gravel was taken out and the casing carried down to rock again. A 6-foot strainer was placed inside the casing at the bottom, and held in place while the casing was withdrawn to near the top of the strainer, and a lead seal swedged to the top of the strainer. With a gasoline engine and small pump, the wells were pumped for 24 to 48 hours, until all sediment was taken out, and the water clear. These wells with the small pump showed a discharge of over 100,000 gallons each in 24 hours.

In order to reach the same level as the original suction line, it was necessary to place the suction line for these walls 12 to 14

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feet deep, this being just above the water line, at a time when the ground water was the lowest known in years. This gave promise of an abundant supply. These wells were then connected to the suction line, with a gate valve to each well to facilitate cleaning when necessary. During the low period of ground water we found that air was being taken into the suction, and some trouble was experienced with the pumps, and considerable inquiry by water consumers as to what we were putting in the water that made it look like milk.

A test of the main suction line was made by shutting off all wells, and an air pressure of 90 pounds placed on it, without any loss for several hours, showing that the air must come from some of the old wells put in in 1909. All these wells on being uncapped showed from 2 to 6 feet of water above the strainers. The only probable solution of the air trouble we could find was that when the wells were in use under suction the water level in the wells was drawn down below the top of the strainers at times, admitting air; and this must have been caused by the partial stoppage of the strainers, or a general low condition of water in the surrounding gravel. We found upon test that no air came from the new wells, the water level in these being 6 to 8 feet above the top of the strainers.

Some engineers having experience with this system of wells have suggested that our 4-inch wells are entirely too small, and that all such wells should be not less than 6 inches in diameter, but rather should have been 8 to 10 inches, with no strainers when in water bearing gravel, but should have perforations or holes in the bottom of the casing equal to one and one-half times the area of the pipe. Then instead of drawing the water from the body of the well, a smaller suction to be dropped inside the outer casing, well to the bottom, and connected to the suction. This would obviate the trouble of air finding its way through the top part of the strainer, and allow the well to operate until nearly exhausted.

This paper is presented for your consideration, with a view of bringing out suggestions of the best method of constructing wells in gravel.

DISCUSSION

MR. C. W. WILES: Mr. Chairman and Gentlemen, many of you do not rely on gravel for the water supply; but those who do know that it is a very important matter to know how to get water out of the gravel into the pump. The paper is simply a rehash of our sys-

tem of taking water from gravel, and it will interest possibly those who are similarly situated.

MR. W. J. HADDOW: The city of Brantford, a Canadian city, draws all of its water from gravel bar soil, using a different method altogether from that described by the writer of the paper. We have a long collecting gallery made of perforated tile pipe laid corresponding with the contour of the river, and the water flows down through it into a large concrete well. In case of low water we have an arrangement by which we can admit water from the river and cause it to flow to a central well from which it is distributed in various directions so that it will fall into this collecting gallery. By thus flooding the soil we obviate the low water difficulty.

MR. W. E. HASELTINE: We get our water from gravel. We have found in our case that we do not have to go more than 15 or 18 feet for it; it is comparatively near the surface. We have dug down to a depth of 15 to 18 feet and constructed a gallery similar to the gallery mentioned by the last speaker. The walls are laid with rock and reinforced with concrete cap. The water is carried from there into the well which is also located in the gravel, and the water is pumped from that. We, of course, have no trouble of the kind referred to by the gentleman who read the paper.

MR. JOHN W. MOORE: Throughout a large part of Indiana it is found desirable to tap the water bearing gravel stratum and also the underlying water bearing limestone stratum with the same well. One of the methods by which this combination well is successfully constructed is as follows: Assuming that the finished well shall be 10 inches in diameter, first a drive pipe 12 inches in diameter is sunk to rock, the depth and thickness of the water bearing gravel strata being carefully noted. A 10-inch diameter hole is then drilled to the desired depth into the water-bearing rock. A 10-inch diameter pipe is then lowered inside the 12-inch drive pipe and seated on the rock. One or more screens, 10 inches in diameter are made up and form a part of this 10-inch pipe, the screens being located so that they will come opposite the several water-bearing gravel strata. The 12-inch drive pipe is then pulled, which allows the water from the gravel to enter the well. In designing air lift pumping systems the writer has also used this method to secure the proper submergence.

MR. H. C. HODGKINS: There is a gentleman here who comes down from a district where they have the finest farms, and the population is largely German, even in larger percentage than here in Cincinnati. He is taking water from wells in a very unique way. The speaker would like to call on Mr. Hymmen, of Berlin, Ontario.

MR. H. HYMMEN: We have altogether about fifteen wells that we are using. Some of them are pumped by compressed air. We have started to use turbine pumps, direct connected, electric drive, which are giving us very good results. We had air on at first. When we first put in our air plant we pumped out sand and filled up our conduit. We then put on a small turbine pump, a 3-inch suction electric drive turbine pump, direct connected. We are getting 75,000 gallons in 24 hours. Some of these wells have 20 feet suction, and some 30 feet suction. They are down 32 feet in the well.